

1. A nucleic acid comprising a modified gene encoding an anti-microbial protein wherein the coding sequence is from the natural host, but has been modified to allow expression of the active form.
2. The gene of claim 1 wherein the modified gene is operatively linked to at least one mammalian regulatory sequence.
3. The gene of claim 1 wherein the modified gene contains mutations that eliminate one or more glycosylation sites.
4. A modified gene comprising a gene encoding lysostaphin, wherein the lysostaphin gene has been modified to allow expression of the active form of lysostaphin.
5. The gene of claim 4 wherein the modified gene is operatively linked to at least one mammalian regulatory sequence.
6. The gene of claim 4 wherein the modified gene is operatively linked to at least one mammalian regulatory sequence and contains mutations that eliminate one or more glycosylation sites.
7. The gene of claim 4 wherein the modified gene is operatively linked to at least one mammalian regulatory sequence and contains mutations that eliminate both glycosylation sites.
8. The gene of claim 4 wherein the gene encoding lysostaphin comprises prepolysostaphin.
9. The gene of claim 4 wherein the gene encoding lysostaphin comprises polysostaphin.

10. The gene of claim 4 wherein the gene encoding lysostaphin comprises mature lysostaphin.

11. A nucleic acid comprising a gene encoding lysostaphin that is biologically active when expressed in mammalian cells.

12. The gene of claim 11 wherein the gene encoding lysostaphin is modified as compared with SEQ ID NO: 3, modifications selected from the group consisting of:

at least one mammalian regulatory sequence operatively linked to the lysostaphin coding region; and  
removal of at least one glycosylation site.

13. The gene of claim 11 wherein the gene encoding lysostaphin is modified as in SEQ ID NO: 3 which comprises:

a eukaryotic start codon;  
the Kozak expression start site consensus sequence;  
a eukaryotic promoter  
a eukaryotic secretion signal; and  
the lysostaphin gene from which two glycosylation sites in the lysostaphin gene from which two glycosylation sites in the lysostaphin gene were removed.

14. The gene of claim 11 wherein the gene encoding lysostaphin is modified as in SEQ ID NO: 3 which comprises:

a eukaryotic start codon;  
the Kozak expression start site consensus sequence;  
a eukaryotic promoter; and  
the lysostaphin gene from which two glycosylation sites in the lysostaphin gene from which two glycosylation sites in the lysostaphin gene were removed.

15. The gene of claim 11,12,13 or 14 wherein the gene encoding lysostaphin comprises preprolysostaphin.
16. The gene of claim 11,12,13 or 14 wherein the gene encoding lysostaphin comprises prolysostaphin.
17. The gene of claim 11,12,13 or 14 wherein the gene encoding lysostaphin comprises mature lysostaphin.
18. A method for treating staphylococcal infection in a mammalian system, the method comprising expressing in the cells of the system, a modified gene encoding lysostaphin.
19. The method of claim 18 wherein expressing the gene involves expressing a copy of the gene which is integrated into the cellular genome.
20. The method of claim 18 wherein the gene encoding lysostaphin is modified as compared to SEQ ID NO: 3 so that at least one mammalian regulatory sequence is operatively linked to the lysostaphin coding region and at least one glycosylation site is removed.
21. The method of claim 18 wherein the gene encoding lysostaphin is modified as in SEQ ID NO: 3 so that at least one mammalian regulatory sequence is operatively linked to the lysostaphin coding region and both glycosylation sites are removed.
22. The method of claim 18 wherein the gene encoding lysostaphin is modified as in SEQ ID NO: 3 which comprises:
- a eukaryotic start codon;
  - the Kozak expression start site consensus sequence;
  - a eukaryotic promoter

a eukaryotic secretion signal; and

the lysostaphin gene from which two glycosylation sites in the lysostaphin gene from which two glycosylation sites in the lysostaphin gene were removed.

23. The gene of claim 21 wherein the gene encoding lysostaphin is modified as in SEQ ID NO: 3 which comprises:

a eukaryotic start codon;

the Kozak expression start site consensus sequence;

a eukaryotic promoter; and

the lysostaphin gene from which two glycosylation sites in the lysostaphin gene from which two glycosylation sites in the lysostaphin gene were removed.

24. The method of claim 18,22, or 23 wherein the gene encoding lysostaphin comprises preprolysostaphin.

25. The method of claim 18,22, or 23 wherein the gene encoding lysostaphin comprises prolysostaphin.

26. The method of claim 18,22, or 23 wherein the gene encoding lysostaphin comprises mature lysostaphin.

27. A transgenic mammalian animal which comprises a transgene encoding lysostaphin.

28. The transgenic mammalian animal of claim 27 wherein the lysostaphin transgene has been modified for expression of an active form in mammalian cells.

29. The transgenic mammalian animal of claim 27 wherein the transgene encoding lysostaphin is modified as in SEQ ID NO: 3 which comprises:

a eukaryotic start codon;  
the Kozak expression start site consensus sequence;  
a eukaryotic promoter  
a eukaryotic secretion signal; and  
the lysostaphin gene from which two glycosylation sites in the lysostaphin gene  
from which two glycosylation sites in the lysostaphin gene were removed.

30. The gene of claim 27 wherein the gene encoding lysostaphin is modified as in SEQ ID  
NO: 3 which comprises:

a eukaryotic start codon;  
the Kozak expression start site consensus sequence;  
a eukaryotic promoter; and  
the lysostaphin gene from which two glycosylation sites in the lysostaphin gene  
from which two glycosylation sites in the lysostaphin gene were removed.

31. The transgenic mammalian animal of claim 27 wherein the modified transgene is inserted  
into the bovine  $\beta$ -lactoglobulin expression cassette which comprises:

4.2 kilobase pairs of the 5'-regulatory region of the bovine  $\beta$ -lactoglobulin gene;  
exons 5, 6, and 7 of the bovine  $\beta$ -lactoglobulin gene; and  
2.0 kilobases of 3'-untranslated region of the bovine  $\beta$ -lactoglobulin gene.

32. A transgenic mammalian animal which comprises a transgene encoding an anti-microbial  
protein.

33. The transgenic mammalian animal of claim 32 wherein the anti-microbial transgene has  
been modified for expression of an active form in mammalian cells.

34. The transgenic mammalian animal of claim 32 wherein the anti-microbial transgene encoding lysostaphin is modified to comprise:

a eukaryotic start codon;

the Kozak expression start site consensus sequence;

a eukaryotic promoter

a eukaryotic secretion signal; and

the lysostaphin gene from which two glycosylation sites in the lysostaphin gene from which two glycosylation sites in the lysostaphin gene were removed.

35. The gene of claim 32 wherein the gene encoding the anti-microbial is modified to comprise:

a eukaryotic start codon;

the Kozak expression start site consensus sequence;

a eukaryotic promoter; and

the lysostaphin gene from which two glycosylation sites in the lysostaphin gene from which two glycosylation sites in the lysostaphin gene were removed.

36. The transgenic mammalian animal of claim 32 wherein the modified transgene is inserted into the bovine  $\beta$ -lactoglobulin expression cassette which comprises:

4.2 kilobase pairs of the 5'-regulatory region of the bovine  $\beta$ -lactoglobulin gene;

exons 5, 6, and 7 of the bovine  $\beta$ -lactoglobulin gene; and

2.0 kilobases of 3'-untranslated region of the bovine  $\beta$ -lactoglobulin gene.